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January 18, 2002

BOX PCT

Commissioner for Patents
Washington, D.C. 20231

PCT/JP00/03241
-filed May 22, 2000

Re: Application of Tsuneo KAWAGUCHI, Takashi KANAYA, Toshihiro ENYA
ELECTRIC DISCHARGE MACHINING APPARATUS USING LINEAR MOTOR DRIVE
Assignee: MITSUBISHI DENKI KABUSHIKI KAISHA
Our Ref: Q68051

Dear Sir:

The following documents and fees are submitted herewith in connection with the above application for the purpose of entering the National stage under 35 U.S.C. § 371 and in accordance with Chapter I of the Patent Cooperation Treaty:

- ☑ an executed Declaration and Power of Attorney.
- ☐ an English translation of the International Application.
- ☑ 5 sheet(s) of drawings.
- ☐ an English translation of Article 19 claim amendments.
- ☐ an English translation of Article 34 amendments (annexes to the IPER).
- ☑ an executed Assignment and PTO 1595 form.
- ☑ a Form PTO-1449 listing the ISR references, and a complete copy of each reference.
- ☑ a Preliminary Amendment

It is assumed that copies of the International Application, the International Search Report, the International Preliminary Examination Report, and any Articles 19 and 34 amendments as required by § 371(c) will be supplied directly by the International Bureau, but if further copies are needed, the undersigned can easily provide them upon request.

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PCT/JP00/03241
-filed May 22, 2000

The Government filing fee is calculated as follows:

Total claims	4	-	20	=	_____	x	$18.00	= $.00
Independent claims	1	-	3	=	_____	x	$84.00	= $.00
Base Fee								$890.00
TOTAL FILING FEE								$890.00
Recordation of Assignment								$ 40.00
TOTAL FEE								$930.00

Checks for the statutory filing fee of $890.00 and Assignment recordation fee of $40.00 are attached. You are also directed and authorized to charge or credit any difference or overpayment to Deposit Account No. 19-4880. The Commissioner is hereby authorized to charge any fees under 37 C.F.R. §§ 1.16, 1.17 and 1.492 which may be required during the entire pendency of the application to Deposit Account No. 19-4880. A duplicate copy of this transmittal letter is attached.

There is no §119 claim to priority.

Respectfully submitted,

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Richard C. Turner
Registration No. 29,710

Date: January 18, 2002

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Tsuneo KAWAGUCHI, et al.

Appln. No.: Not yet assigned

Confirmation No.: Not yet assigned | Group Art Unit: Not yet assigned

Filed: January 18, 2002 | Examiner: Not yet assigned

For: ELECTRIC DISCHARGE MACHINING APPARATUS USING LINEAR MOTOR DRIVE

PRELIMINARY AMENDMENT

Commissioner for Patents
Washington, D.C. 20231

Sir:

Prior to examination, please amend the above-identified application as follows:

IN THE CLAIMS:

Please cancel claim 1 without prejudice or disclaimer.

Please enter the following amended claim:

4. The electric discharge machining apparatus using linear motor drive according to claim 2, wherein a dust cover is provided around the driving device configured by the linear motor.

REMARKS

Entry and consideration of this Amendment is respectfully requested.

Respectfully submitted,

Richard C. Turner
Registration No. 29,710

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Date: January 18, 2002

APPENDIX

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Claim 1 is canceled.

The claims are amended as follows:

4. (Amended) The electric discharge machining apparatus using linear motor drive according to [claims 2 or 3] claim 2, wherein a dust cover is provided around the driving device configured by the linear motor.

SPECIFICATION

TITLE OF THE INVENTION

Electric discharge machining apparatus using linear motor drive

TECHNICAL FIELD

The present invention relates to an improvement in an electric discharge machining apparatus using linear motor drive which supplies a machining power to in a space between an electrode and a workpiece to cause an electric discharge, and allows the electrode and the workpiece to relatively move by means of a linear motor, thereby machining the workpiece into a desired shape.

BACKGROUND ART

Fig. 4 is a configuration view of a conventional electric discharge machining apparatus using linear motor drive which is disclosed in Japanese Patent Application Laid-open Publication No. 8-309620. In this drawing, the reference numeral 1 denotes an electrode, the reference numeral 2 denotes a workpiece, the reference numeral 3 denotes a spindle head, the reference numeral 4 denotes a chuck, the reference numeral 5 denotes a head, the reference numeral 6 denotes a machining tank, the reference numeral

7 denotes a machining liquid, the reference numeral 8 denotes an X-axis driving linear motor, the reference numeral 9 denotes a Y-axis driving linear motor, and the reference numeral 10 denotes a Z-axis driving linear motor. The electrode 1 is held by the chuck 4 which is connected with the spindle head 3. Further, the workpiece 2 is fixed in the machining tank 6 and dipped in the machining liquid 7. The X-axis driving linear motor 8, the Y-axis driving linear motor 9 and the Z-axis driving linear motor 10 constitutes a driving device which drives the respective axes to cause the electrode 1 and the workpiece 2 move in relation to each other. Additionally, a moving part and a fixed part of each axis driven by the X-axis driving linear motor 8, the Y-axis driving linear motor 9 and the Z-axis driving linear motor 10 are linearly supported by a linear guiding mechanism (not shown) so as to allow relative movement.

The electric discharge machining apparatus using linear motor drive is such that in an electric discharge machining apparatus which supplies an inter-electrode space between the electrode 1 and the workpiece 2 with a machining power by means of a machining power supply unit (not shown), and carries out electric discharge machining on the workpiece 2 to make it into a desired shape, while allowing relative movement of the electrode 1 and the workpiece 2 by means of a driving device, as shown in Fig. 4, a direct driving

system by the X-axis driving linear motor 8, the Y-axis driving linear motor 9 and the Z-axis driving linear motor 10 as shown in Fig. 4 is employed.

Such an electric discharge machining apparatus using linear motor drive provides higher positioning accuracy in comparison with those of the type that employs a driving device which involves rotation/longitudinal motion conversion for converting a rotation output of a servo motor to a longitudinal motion by means of a ball screw, because an error such as lead error of ball screw can be eliminated. Furthermore, since there is no power transmission element for carrying out conversion of rotation/longitudinal motion, backlash is eliminated as well as the rigidity is improved, which improves the positioning accuracy and the quick responsibility. Therefore, the electric discharge machining apparatus using linear motor drive can realize high speed and high accuracy electric discharge machining.

Fig. 5 is an explanatory view showing a configuration of a linear motor used in a conventional electric discharge machining apparatus using linear motor drive. In the drawing, the reference numeral 11 denotes a moving part, the reference numeral 12 denotes a fixed part, the reference numeral 13 denotes an iron core, the reference numeral 14 denotes a coil, the reference numeral 15 denotes cooling piping, the reference numeral 16 denotes a magnet, the

reference numeral 17 denotes a magnet supporting plate and the reference numeral 18 denotes a base plate, and the moving part 1 which is on the primary side of the linear motor and the fixed part 2 which is on the secondary side of the linear motor are supported by a linear guiding mechanism (not shown) so that they can linearly move in relation to each other. Since the heat generated by the coil 14 can efficiently be cooled by forming the cooling piping in the iron core 13, it is possible to improve the rated characteristics. The configuration described above is disclosed in USP 4,839,545, for example.

Because of heat conduction and heat transfer due to heat generation of the driving device of the electric discharge machining apparatus, thermal expansion and thermal distortion will occur in the mechanical structure of the electric discharge machining apparatus. Since machining accuracy on the order of μm is requested for an electric discharge machining apparatus, it is necessary to control these thermal expansion and thermal distortion.

In the conventional electric discharge machining apparatus using linear motor drive having the configurations illustrated in Figs. 4 and 5, the moving part 11 which is on the primary side of the linear motor is cooled for the purpose of improving rated characteristics of the linear motor, while on the contrary, the fixed part 12 which is

on the secondary side of the linear motor is not cooled. In such a conventional electric discharge machining apparatus using linear motor drive, thermal expansion and thermal distortion will occur in the fixed part 12 because of heat transfer from the moving part 11 to the fixed part 12 and dielectric loss of the magnet 16. Therefore, in the electric discharge machining apparatus using linear motor drive in which machining operation proceeds as the electrode 1 and the workpiece 2 move in relation to each other by means of the X-axis driving linear motor 8, the Y-axis driving linear motor 9 and the Z-axis driving linear motor 10 and in which high machining accuracy on the order of μm is requested, the relative positional accuracy of the electrode 1 and the workpiece 2 is deteriorated, which leads the first problem that the machining accuracy of the workpiece 2 decreases.

An electric discharge machining apparatus is often installed in the vicinity of a graphite working machine for machining a graphite electrode, a machining center for performing pre-working on a workpiece and the like, so that usually a lot of dust exists in the vicinity of the electric discharge machining apparatus. Furthermore, volatilization of machining liquid of the electric discharge machining apparatus also occurs.

Moreover, it is difficult to seal the driving parts

of the linear motor because they move in the longitudinal direction, and also it is difficult to seal the linear guiding mechanism which supports between the moving part 11 and the fixed part 12 of the linear motor.

Therefore, in the conventional electric discharge machining apparatus using linear motor drive, there arises a second problem that the fixed part 12, the magnet 16 and the moving part 11 of the linear motor get damaged because of the above mentioned dust and volatilization of machining liquid.

DISCLOSURE OF THE INVENTION

The present invention was devised for solving the above mentioned problems. It is an object of the present invention to provide an electric discharge machining apparatus using linear motor drive capable of efficiently conducting cooling operation for preventing thermal expansion and thermal distortion of a mechanical structure due to a rise in temperature of driving parts of linear motor.

It is an another object of this invention to provide an electric discharge machining apparatus using linear motor drive capable of efficiently protecting the driving parts and the like of linear motor from dust.

An electric discharge machining apparatus using linear motor drive according to the present invention is an electric

discharge machining apparatus using linear motor drive in which a machining power supply unit supplies a machining power in a space between an electrode and a workpiece and the workpiece is machined while the electrode and the workpiece are moved in relation to each other by means of a driving device implemented by a linear motor. There is provided a cooling device for cooling at least one of a magnet and a magnet supporting plate which supports the magnet which are on the secondary side of the linear motor.

Also, an electric discharge machining apparatus using linear motor drive according to the present invention is an electric discharge machining apparatus using linear motor drive in which a machining power supply unit supplies a machining power in a space between an electrode and a workpiece and the workpiece is machined while the electrode and the workpiece are moved in relation to each other by means of a driving device implemented by a linear motor. There is provided a magnet supporting plate for supporting a magnet which is on the secondary side of the linear motor, a base plate formed with at least one hole portion, a spacer for holding the magnet supporting plate and the base plate while leaving a predetermined space therebetween, and a cooling device for injecting compressed gas from the hole portion of the base plate toward the magnet supporting plate.

Moreover, the magnet supporting plate is formed with

a cooling fin.

Furthermore, a dust cover is provided around the driving device configured by the linear motor.

The present invention, which is configured as described above, provides the following advantage.

The electric discharge machining apparatus using linear motor drive according to the present invention provides an advantage that it is possible to obtain a high-performance and high-accuracy electric discharge machining apparatus using linear motor drive capable of efficiently performing cooling operation for suppressing thermal expansion and thermal distortion of the mechanical structure due to a rise in temperature of the driving parts of linear motor.

Also such an advantage is provided that it is possible to obtain a high-reliability electric discharge machining apparatus using linear motor drive capable of efficiently preventing the driving parts and the like of linear motor from dust.

Also such an advantage is provided that it is possible to achieve the above advantages while suppressing increase of the cost with simple structure.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is an explanatory view showing a configuration

of a linear motor in an electric discharge machining apparatus using linear motor drive according to the first embodiment of the present invention.

Fig. 2 is an explanatory view showing a configuration of a linear motor in an electric discharge machining apparatus using linear motor drive according to the second embodiment of the present invention.

Fig. 3 is an explanatory view showing a configuration of proximity of a linear motor in an electric discharge machining apparatus using linear motor drive according to the third embodiment of the present invention.

Fig. 4 is a configuration view of an electric discharge machining apparatus using linear motor drive.

Fig. 5 is an explanatory view showing a configuration of linear motor used in a conventional electric discharge machining apparatus using linear motor drive.

BEST MODE FOR CARRYING OUT THE INVENTION

First Embodiment:

A general configuration of an electric discharge machining apparatus using linear motor drive according to the present invention is similar to that of the prior art shown in Fig. 4. Fig. 1 is an explanatory view showing a configuration of a linear motor in an electric discharge machining apparatus using linear motor drive according to

the first embodiment of the present invention. In Fig. 1, the reference numeral 11 denotes a moving part, the reference numeral 12 denotes a fixed part, the reference numeral 13 denotes an iron core, the reference numeral 14 denotes a coil, the reference numeral 15 denotes cooling piping, the reference numeral 16 denotes a magnet, the reference numeral 17 denotes a magnet supporting plate, the reference numeral 18 denotes a base plate, the reference numeral 19 denotes a spacer, the reference numeral 20 denotes a compressed gas such as air and nitrogen gas, the reference numeral 21 denotes a coupler, the reference numeral 22 denotes piping such as an air tube, the reference numeral 23 denotes a compressor, the reference numeral 24 denotes a dryer for removing moisture of compressed gas from the compressor 23 to give dry gas, the reference numeral 25 denotes a lubricator which controls lubrication of pneumatic appliances and the reference numeral 26 denotes a regulator for adjusting and controlling the pressure of the compressed gas delivered from the compressor 23, and the coupler 21, the piping 22, the compressor 23, the dryer 24, the lubricator 25 and the regulator 26 correspond to a cooling device for cooling the magnet 16, the magnet supporting plate 17 and the like which are on the secondary side of the linear motor. Furthermore, the moving part 11 which is on the primary side of the linear motor and the fixed part 12 which is on the secondary side

are supported by a linear guiding mechanism (not shown) so as to leave a space of, e.g., about 0.5 mm therebetween and so as to be linearly movable in relation to each other.

In Fig. 1, the same or corresponding parts as those of Fig. 5 showing the prior art are denoted by the same reference numerals. Furthermore, configuration of the moving part 11 is as same as the configuration of Fig. 5, while configuration of the fixed part 12 is different from the configuration of Fig. 5. The magnet 16 is fixed to the magnet supporting plate 17 by, for example, adhesion, and the magnet supporting plate 17 is connected to the base plate 18 via the spacer 19 while leaving a space of, for example, about 5 mm to 10 mm therebetween. The base plate 18 is drilled with a hole portion 18a to which the coupler 21 and the piping 22 are connected for supplying the compressed gas 20 from the compressor 23, the dryer 24, the lubricator 25 and the regulator 26. After colliding with the magnet supporting plate 17 as a collision jet, the compressed gas 20 moves through the space between the magnet supporting plate 17 and the base plate 18.

In this way, by making the compressed gas 20 collide with the magnet supporting plate 17 in the form of a collision jet, heat conductivity is increased, so that it is possible to cool the secondary side of the linear more efficiently.

In the configuration shown in Fig. 1, the space between

the magnet supporting plate 17 and the base plate 18, the diameter and the number of hole portion 18a formed in the base plate, the flow rate of the compressed gas supplied from the hole portion 18a and the like can be determined in accordance with the calorific value to be cooled, for example, by experiments.

The electric discharge machining apparatus has appliances such as the compressor 23, the dryer 24, the lubricator 25 and the regulator 26 because it is necessary to supply the chuck 4 which is connected with the spindle head 3 and an air cylinder or the like for ascending/descending the machining tank 6 with the compressed gas. Therefore, in the electric discharge machining apparatus using linear motor drive according to the present invention, it is not necessary to newly provide the appliances such as the compressor 23, the dryer 24, the lubricator 25 and the regulator 26 constituting the cooling device for the purpose of cooling the secondary side of the linear motor, so that it is possible to cool the secondary side of the linear motor with simple configuration while preventing the cost from rising due to installation of another set of appliances.

In the above description, explanation is given for the case where the spacer 19 is interposed between the magnet supporting plate 17 and the base plate 18, thereby connecting

and holding the magnet supporting plate 17 and the base plate 18 while leaving a predetermined space therebetween, however, the spacer 19 may be any form insofar as it can hold the magnet supporting 17 and the base plate 18 at a predetermined space.

Furthermore, in the above description, explanation is given for the case where the moving part is implemented by a coil or the like and the fixer part is implemented by a magnet or the like, however, since the moving part and the fixed part move in relation to each other, it is also possible to regard the part implemented by a coil or the like as the fixed part, while regarding the part implemented by a magnet or the like as the moving part. In such a case, the present invention performs cooling of the moving part.

Second Embodiment:

Fig. 2 is an explanatory view showing a configuration of a linear motor in an electric discharge machining apparatus using linear motor drive according to the second embodiment of the present invention, in which the same or corresponding parts as those in Fig. 1 showing the first embodiment are denoted by the same reference numerals. In Fig. 2, the reference numeral 27 denotes a cooling fin, which is formed integrally with the magnet supporting plate 17 or fixed to the magnet supporting plate 17. After colliding with the magnet supporting plate 17 as a collision jet, the

compressed gas 20 supplied from the compressor 23, the dryer 24, the lubricator 25 and the regulator 26 moves around the cooling fin 27 through the space between the magnet supporting plate 17 and the base plate 18.

By adopting the above configuration providing the cooling fin 27, the surface area which is cooled by the compressed gas 20 to radiate the heat is enlarged, so that it is possible to achieve more efficient cooling.

Furthermore, if the cooling fin 27 is not formed integrally with the magnet supporting plate 17, but formed as a separate part and fixed to the magnet supporting plate 17, it is possible to improve the cooling efficiency by interposing, for example, a heat conductive grease, at the junction between the cooling fin 27 and the magnet supporting plate 17.

Third Embodiment:

Fig. 3 is an explanatory view showing a configuration of proximity of a linear motor in an electric discharge machining apparatus using linear motor drive according to the third embodiment of the present invention, and shows an example of configuration in the vicinity of the Z-axis for driving the spindle head 3. In Fig. 3, the same reference numerals as in Fig. 1 showing the first embodiment and in Fig. 2 showing the second embodiment represent the same or corresponding parts, and the reference numeral 28 denotes

a dust cover, the reference numeral 28a denotes an opening of the dust cover 28, and the reference numeral 28b denotes an inside space of the dust cover 28.

Similarly to the second embodiment, the compressed gas 20 moves around the cooling fin 27 through the space between the magnet supporting plate 17 and the base plate 18 after colliding with the magnet supporting plate 17 as a collision jet.

Furthermore, since the opening 28a of the dust cover 28 is formed as small as possible, and the compressed gas 20 is supplied inside the dust cover 28, the inside space 28b of the dust cover 28 is at a positive pressure, so that it is possible to prevent dust or the like from entering through the opening 28a.

Accordingly, it is possible to prevent the magnet 16 of the fixed part 12, the moving part 11, the linear guiding mechanism and the like of the linear motor from being damaged by the entry of dust and the like.

Furthermore, by orienting the cooling fin 27 to the direction of the opening 28a, and forming the flow of the compressed gas 20 toward the opening 28a, it is possible to further improve the dust preventing efficiency.

As described above, the electric discharge machining apparatus using linear motor drive according to the third embodiment of the present invention can effectively protect

the cooling and driving parts on the secondary side of the linear motor from dust with simple configuration by combining the pressure rise owing to a jet of the cooling compressed gas 20 and the dust cover 28 around the driving device.

Furthermore, since the compressed gas 20 is dried by the dryer 24, in the case where compressed air is used as the compressed gas 20, for example, there remains little water vapor in the inside space 28b of the dust cover 28, so that also protecting effects such as rust proofing of the appliances inside the dust cover 28 can be achieved.

When the dust cover 28 is provided, it is necessary to conduct particularly effective cooling because the temperature inside the dust cover 28 is likely to rise, and this can be achieved by increasing the number of hole portion 18a formed in the base plate 18, for supplying the compressed gas 20, by increasing the flow rate of the compressed gas, and by increasing the number and the surface area of the cooling fin 27.

In the above description, explanation is given while taking a profiling electric discharge machining apparatus as an example, however, the same effect is achieved when the present invention is applied to a wire electric discharge machining apparatus.

INDUSTRIAL APPLICABILITY

As described above, the electric discharge machining apparatus using linear motor drive according to the present invention is suitably used in electric discharge machining operation.

CLAIMS

1. An electric discharge machining apparatus using linear motor drive in which a machining power supply unit supplies a machining power in a space between an electrode and a workpiece and the workpiece is machined while the electrode and the workpiece are moved in relation to each other by means of a driving device implemented by a linear motor,

wherein the electric discharge machining apparatus using linear motor drive has a cooling device for cooling at least one of a magnet and a magnet supporting plate which supports the magnet which are on the secondary side of the linear motor.

2. An electric discharge machining apparatus using linear motor drive in which a machining power supply unit supplies a machining power in a space between an electrode and a workpiece and the workpiece is machined while the electrode and the workpiece are moved in relation to each other by means of a driving device implemented by a linear motor,

wherein the electric discharge machining apparatus using linear motor drive comprises:

a magnet supporting plate for supporting a magnet which is on the secondary side of the linear motor;

a base plate formed with at least one hole portion;

a spacer for holding the magnet supporting plate and

the base plate while leaving a predetermined space therebetween; and

a cooling device for injecting compressed gas from the hole portion of the base plate toward the magnet supporting plate.

3. The electric discharge machining apparatus according to claim 2, wherein the magnet supporting plate is formed with a cooling fin.

4. The electric discharge machining apparatus according to any one of claims 1 to 3, wherein a dust cover is provided around the driving device configured by the linear motor.

FIG.1

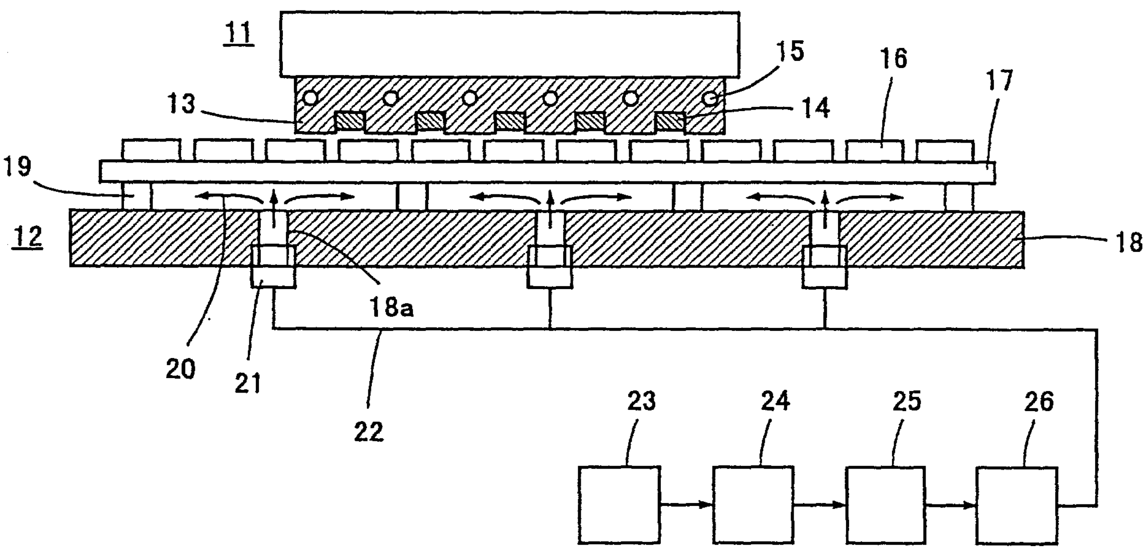


FIG.2

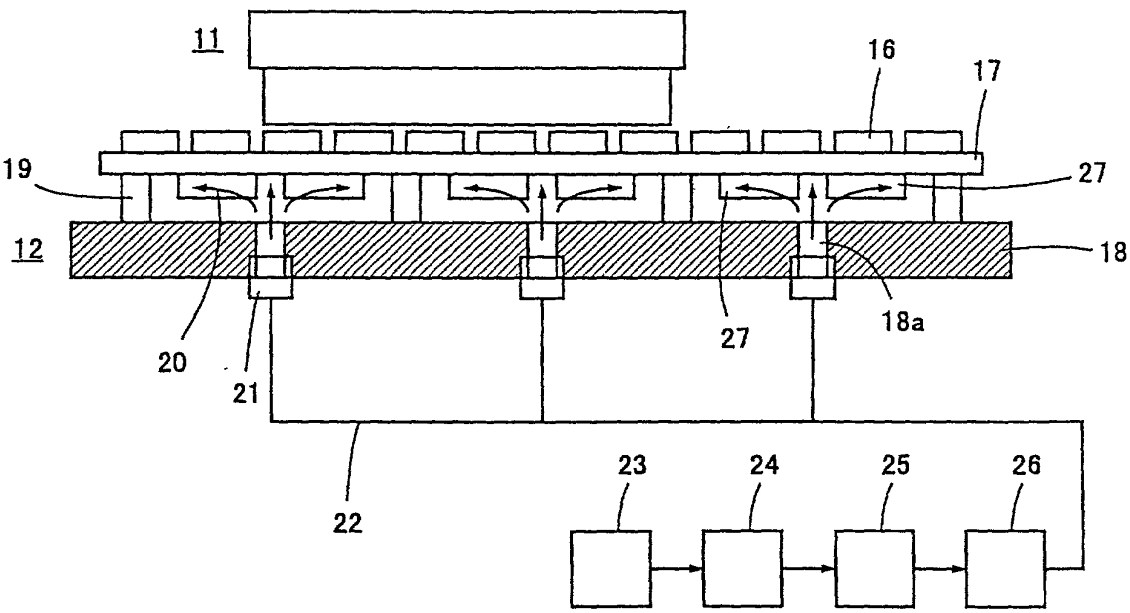


FIG.3

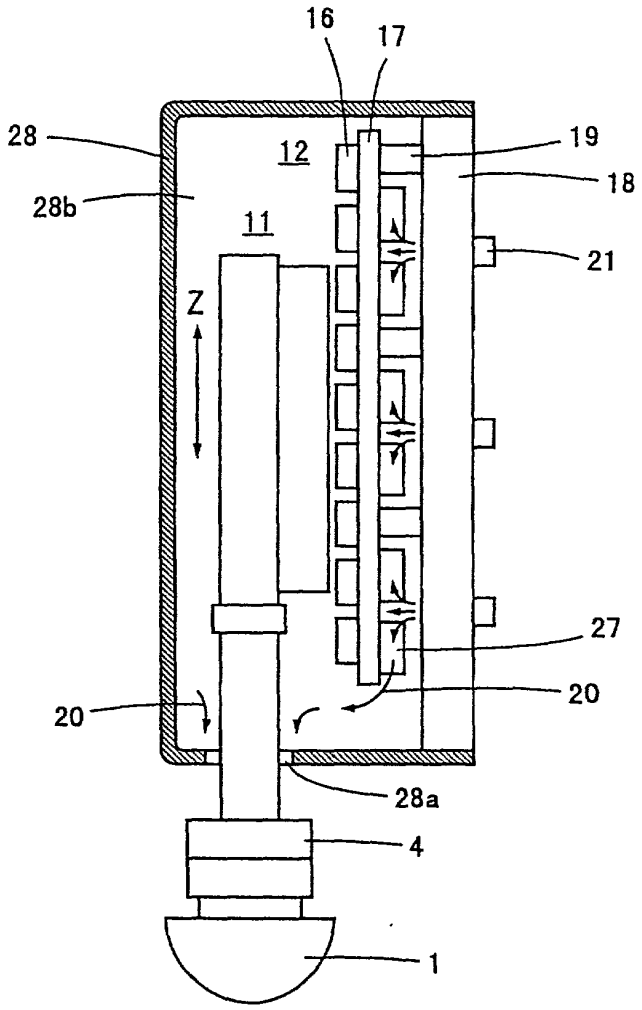


FIG.4

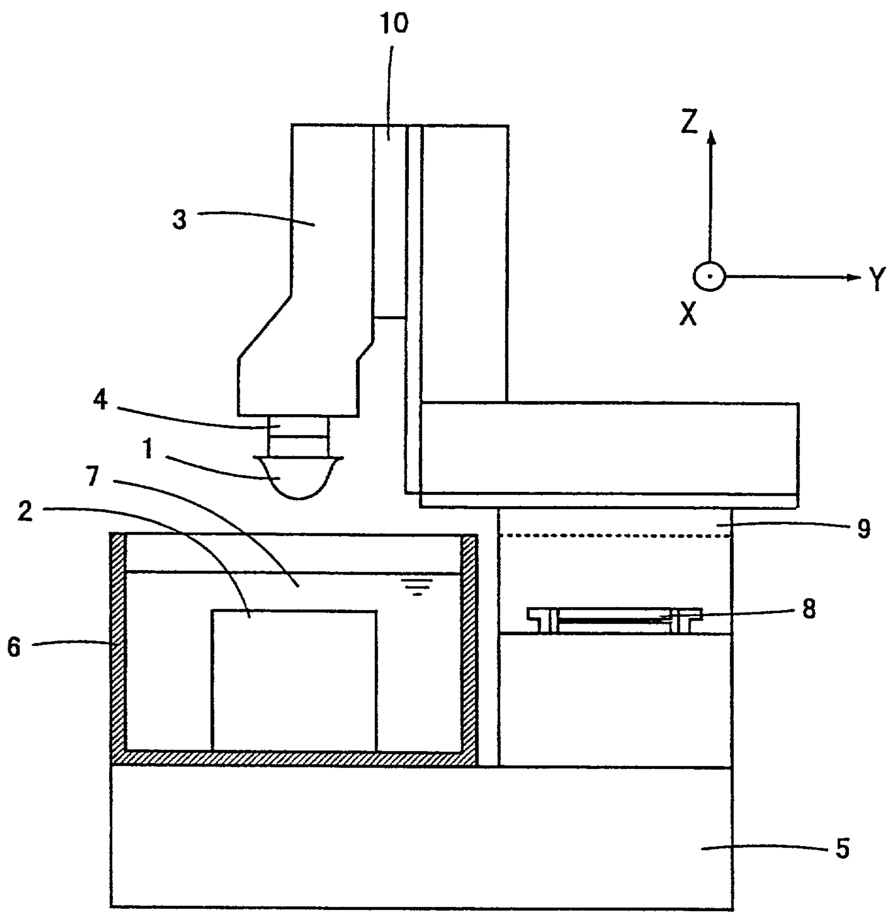
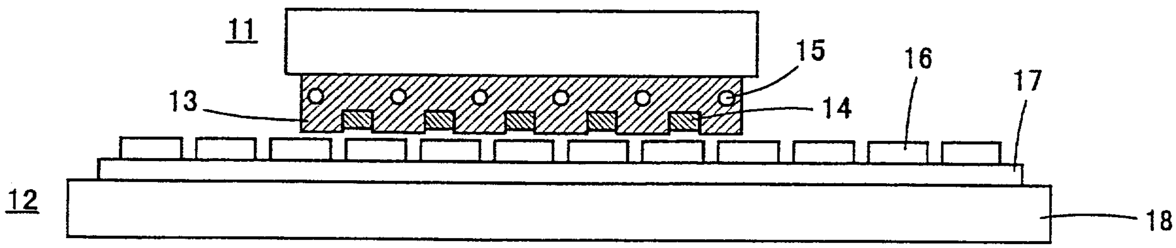


FIG.5



525543-US-01.
PMDA-01100-US

Declaration and Power of Attorney for Patent Application

特許出願宣言書

Japanese Language Declaration

私は、下欄に氏名を記載した発明として、以下の通り宣言する：

As a below named inventor, I hereby declare that:

私の住所、郵便の宛先および国籍は、下欄に氏名に続いて記載したとおりである。

My residence, post office address and citizenship are as stated below next to my name.

名称の発明に関し、請求の範囲に記載した特許を求める主題の本来の、最初にして唯一の発明者である（一人の氏名のみが下欄に記載されている場合）か、もしくは本来の、最初にして共同の発明者である（複数の氏名が下欄に記載されている場合）とほど、

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

ELECTRIC DISCHARGE MACHINING APPARATUS USING LINEAR MOTOR DRIVE

の明細書を
（該当するほうに印を付す）

the specification of which
(check one)

☒ ここに添付する。

☒ is attached hereto.

☐ ___月___日に提出され、米国出願番号または特許協定条約国際出願番号を_____とし、
（該当する場合）_____に訂正されました。

☐ was filed on _____
as United States Application Number or
PCT International Application Number
_____ and was amended on
_____ (if applicable).

私は、前記のとおり補正した請求の範囲を含む前記明細書の内容を検討し、理解したことを表述する。

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

私は、連邦規則法典第37部第1章第56条(a)項に従い、本願の審査に所要の情報を開示すべき義務を有することを認める。

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

Japanese Language Declaration

私は、合衆国法典第35部第119条にもとづく下記の外国特許出願または発明者証出願の外国優先権利益を主張し、さらに優先権の主張に係わる基礎出願の出願日前の出願日を有する外国特許出願または発明者証出願を以下に明記する:

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior foreign applications
先の外国出願

(Number) (番 号)	(Country) (国 名)	(Day/Month/Year Filed) (出願の年月日)	Priority claimed 優先権の主張 Yes あり	No なし
(Number) (番 号)	(Country) (国 名)	(Day/Month/Year Filed) (出願の年月日)	☐ Yes あり	☐ No なし
(Number) (番 号)	(Country) (国 名)	(Day/Month/Year Filed) (出願の年月日)	☐ Yes あり	☐ No なし
(Number) (番 号)	(Country) (国 名)	(Day/Month/Year Filed) (出願の年月日)	☐ Yes あり	☐ No なし
(Number) (番 号)	(Country) (国 名)	(Day/Month/Year Filed) (出願の年月日)	☐ Yes あり	☐ No なし

私は、合衆国法典第35部第120条にもとづく下記の合衆国特許出願の利益を主張し、本願の請求の範囲各項に記載の主題が合衆国法典第35部第112条第1項に規程の態様で先の合衆国出願に開示されていない限度において、先の出願の出願日と本願の国内出願日またはPCT国際出願日の間に公表された連邦規則法典第37部第1章第56条(a)項に記載の所要の情報を開示すべき義務を有することを認める。

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.) (出願番号)	(Filing Date) (出願日)	(現 況) (特許済み、係属中、放棄済み) (Status) (patented, pending, abandoned)
(Application Serial No.) (出願番号)	(Filing Date) (出願日)	(現 況) (特許済み、係属中、放棄済み) (Status) (patented, pending, abandoned)

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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Japanese Language Declaration

委任状： 私は、下記発明者として、以下の代理人をここに選任し、本願の手続きを遂行すること並びにこれに関する一切の行為を特許商標局に対して行うことを委任する。
（代理人氏名及び登録番号を明記のこと）

POWER OF ATTORNEY As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith *(list name and registration number)*

I hereby appoint John H. Mion, Reg. No. 18,879; Donald E. Zinn, Reg. No. 19,046; Thomas J. Macpeak, Reg. No. 19,292; Robert J. Seas, Jr., Reg. No. 21,092; Darryl Mexic, Reg. No. 23,063; Robert V. Sloan, Reg. No. 22,775; Peter O. Olexy, Reg. No. 24,513; J. Frank Osha, Reg. No. 24,625; Waddell A. Biggart, Reg. No. 24,861; Robert G. McMorrow, Reg. No. 19,093; Louis Gubinsky, Reg. No. 24,835; Neil B. Siegel, Reg. No. 25,200; David J. Cushing, Reg. No. 28,703; John R. Inge, Reg. No. 26,916; Joseph J. Ruch, Jr., Reg. No. 26,577; Sheldon I. Landsman, Reg. No. 25,430; Richard C. Turner, Reg. No. 29,710; Howard L. Bernstein, Reg. No. 25,665; Alan J. Kasper, Reg. No. 25,426; Kenneth J. Burchfiel, Reg. No. 31,333; Gordon Kit, Reg. No. 30,764; Susan J. Mack, Reg. No. 30,951; Frank L. Bernstein, Reg. No. 31,484; Mark Boland, Reg. No. 32,197; William H. Mandir, Reg. No. 32,156; Scott M. Daniels, Reg. No. 32,562; Brian W. Hannon, Reg. No. 32,778; Abraham J. Rosner, Reg. No. 33,276; Bruce E. Kramer, Reg. No. 33,725; Paul F. Neils, Reg. No. 33,102; and Brett S. Sylvester, Reg. No. 32,765, my attorneys to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith, and request that all correspondence about the application be addressed to SUGHRUE, MION, ZINN, MACPEAK & SEAS, PLLC, 2100 Pennsylvania Avenue, N.W., Washington, D.C. 20037-3202.

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